

Analysis of Mortgage Approval from Government Data

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# Executive Summary

This report presents an analysis of data with regards to mortgage approvals from a given dataset, adapted from the Federal Financial Institutions Examination Council's (FFIEC). The analysis is based on 500,000 observations of mortgage data with 21 features and 1 Label, each containing specific characteristics of HMDA-reported loan application, which covers one particular year.

After exploring the data by calculating summary and descriptive statistics, and by creating visualizations of the data, several potential relationships between mortgage features and the status of an application were identified. After data exploration, data cleaning and some transformations were performed on the features after which a predictive model to classify mortgage loan application into two categories: accepted and not accepted was created.

After performing the analysis, the author presents the following conclusions:

While many factors can help indicate whether a mortgage loan approval gets accepted or not, significant features found in this analysis were:

1. Applicants Income: This represent the applicant’s income in thousands of dollars
2. Loan Amount: An integer variable that represents the size of the requested loan in thousands of dollars
3. Loan Purpose
4. Number of Family units
5. tract\_to\_msa\_md\_income\_pct
6. msa\_md
7. ffiecmedian\_family\_income
8. minority\_population\_pct

Exploratory Data Analysis

The initial data exploration began with some summary and descriptive statistics.

**Individual Feature Statistics**

Summary Statistics for minimum, maximum, mean, median, standard deviation and distinct count were calculated for numeric columns, and the results taken from 500,000 observations are shown in Table 1.

Table 1: Descriptive Statistics

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |
| Column | Count | Mean | Std Dev | Min | Median | Max |
| loan\_type | 500000 | 1.3663 | 0.6906 | 1 | 1 | 4 |
| property\_type | 500000 | 1.0477 | 0.2314 | 1 | 1 | 3 |
| loan\_purpose | 500000 | 2.0668 | 0.9484 | 1 | 2 | 3 |
| occupancy | 500000 | 1.1096 | 0.3261 | 1 | 1 | 3 |
| loan\_amount | 500000 | 221.7532 | 590.6416 | 1 | 162 | 100878 |
| preapproval | 500000 | 2.7647 | 0.5431 | 1 | 3 | 3 |
| msa\_md | 500000 | 181.6070 | 138.4642 | -1 | 192 | 408 |
| state\_code | 500000 | 23.7269 | 15.9828 | -1 | 26 | 52 |
| county\_code | 500000 | 144.5421 | 100.2436 | -1 | 131 | 324 |
| applicant\_ethnicity | 500000 | 2.0362 | 0.5114 | 1 | 2 | 4 |
| applicant\_race | 500000 | 4.7866 | 1.0249 | 1 | 5 | 7 |
| applicant\_sex | 500000 | 1.4624 | 0.6777 | 1 | 1 | 4 |
| applicant\_income | 460052 | 102.3895 | 153.5345 | 1 | 74 | 10139 |
| population | 477535 | 5416.8340 | 2728.1450 | 14 | 4975 | 37097 |
| minority\_population\_pct | 477534 | 31.6173 | 26.3339 | 0.534 | 22.901 | 100 |
| ffiecmedian\_family\_income | 477560 | 69235.6033 | 14810.0588 | 17858 | 67526 | 125248 |
| tract\_to\_msa\_md\_income\_pct | 477486 | 91.8326 | 14.2109 | 3.981 | 100 | 100 |
| number\_of\_owner-occupied\_units | 477435 | 1427.7183 | 737.5595 | 4 | 1327 | 8771 |
| number\_of\_1\_to\_4\_family\_units | 477470 | 1886.1471 | 914.1237 | 1 | 1753 | 13623 |
| lender | 500000 | 3720.1213 | 1838.3132 | 0 | 3731 | 6508 |

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